

REMARKS

Independent claims 8 and 11 have been amended to clarify the invention.

The art rejections are respectfully traversed. Considering first the rejection of claims 8 and 10 as obvious from Sweeney et al. in view of Itou et al., in the Action, the Examiner takes the position that the primary reference Sweeney et al. teaches a method comprising the steps of forming a multilayer film (Fig. 1, #110) on a substrate (Fig. 1 #120) and adjusting a wavefront phase by cutting a portion of a surface thereby roughing the surface. But Sweeney et al does not disclose the step of adjusting a wavefront phase by cutting a portion of a surface thereby roughing the surface as required by Applicant's claims.

Sweeney et al. relates to "A method for repair of amplitude and/or phase defects in lithographic masks. The method involves modifying or altering a portion of the absorber pattern on the surface of the mask blank proximate to the mask defect to compensate for the local disturbance (amplitude or phase) of the optical field due to the defect" (Abstract).

It is clear that "lithographic masks" have the absorber layer (Fig. 1, #130).

In Sweeney et al., the local disturbance in reflectance caused by an amplitude and/or phase defect is balanced by introducing an alteration or modification in the mask pattern (absorber film) proximate the mask defect. In this way the local disturbance (amplitude or phase) of the optical field of the EUV radiation due to the defect is compensated for (column 3, line 62 -column 4 line 1).

A concept of the invention of Sweeney et al. is illustrated by reference to FIGS. 3 and 4. Here, the method is modeled to show the effect of an 80 nm phase defect 310 at the boundary of a 400 nm absorber line 320 on a 4x reduction mask prior to compensation (FIG. 3) and after compensation (FIG. 4) (column 4, line 31 line 35).

Referring now to FIG. 3b, it can be seen that an 80 nm defect has the effect of widening the absorber line by about 9 nm, which constitutes a critical lithographic defect. By removing a portion of the proximate absorber line material and exposing the underlying reflective mask blank (FIG. 4a) the defect can be compensated for by optical balancing and the linewidth defect is removed, as shown in the aerial image (FIG. 4b). Moreover, the amount of the absorber line material removed is not critically shape dependent. Modeling simulations done through the depth of focus showed that the inventive compensation method was still valid (column 4, line 43- line 53).

In the present invention, there is neither an absorber layer, nor introducing an alteration or modification in the mask pattern (absorber film) proximate the mask defect. Rather, in the present invention an optical element is provided from multilayer film reflector by adjusting a wavefront phase of the emerging rays by cutting away a portion of a surface of multilayer film in accordance with an amount of adjustment of the wavefront phase.

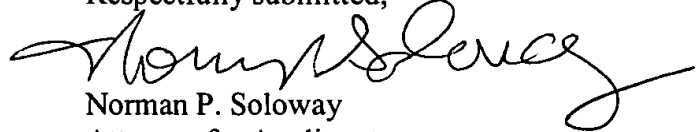
Itou et al. has been cited as teaching a film composed of high and low refractive index materials, and is acknowledged as so teaching. However, the more basic and essential features missing from Sweeney et al. are not supplied by Itou et al. Thus, no combination of Sweeney et al. and Itou et al. could achieve or render obvious claim 8 or claim 10 which depends thereon.

Turning to the rejection of claims 9 and 11 as obvious from Sweeney et al. in view of Itou et al. and further in view of Murakami, the deficiencies of the combination of Sweeney et al. and Itou et al. are discussed above. Murakami also fails to supply the necessary missing teachings to Sweeney et al. and Itou et al. Thus, no combination of Sweeney et al., Itou et al. and Murakami could be said to achieve or render obvious claims 9 or 11.

Having dealt with all the objections raised by the Examiner, the Application is believed to be in order for allowance. Early and favorable action are respectfully requested.

In the event there are any fee deficiencies or additional fees are payable, please charge them (or credit any overpayment) to our Deposit Account Number 08-1391.

Respectfully submitted,



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